CCIS in the Knowledge Centric Age

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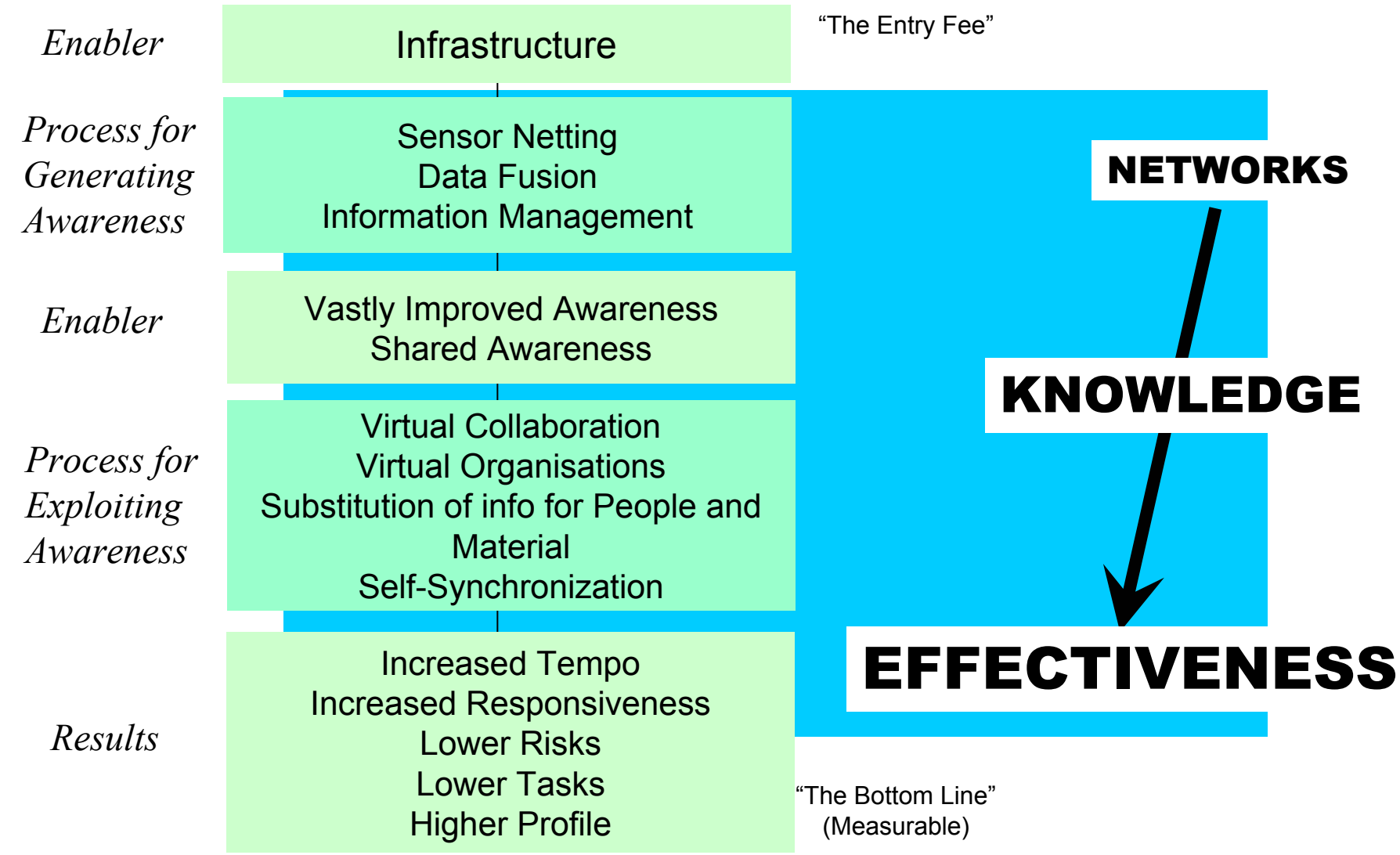
A Knowledge-Age Postulate

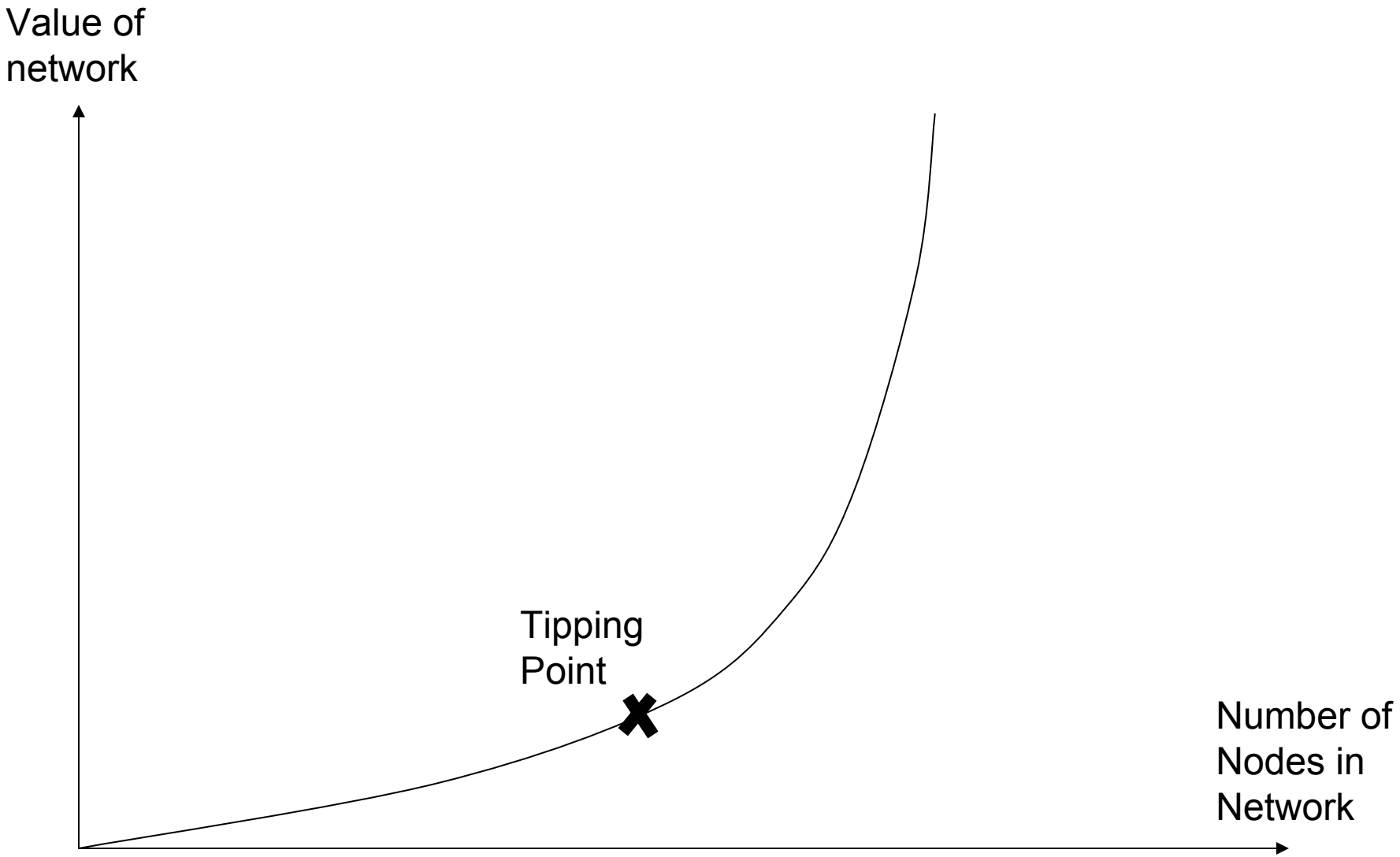


Source: CCRP

Agenda

- Purpose of Command Control and Information Systems (CCIS)
  - Enabling Knowledge-Centric Operations.
- Towards some principles on designing CCIS
  - Fusing the Cognitive and Information Space
  - Command Control Knowledge System (CCKS)
- Architecture of CCKS
  - Solutions Architecture: Serviced-Oriented foundation Architecture, Sense-Maker, Process-Maker, Collaborator
  - The Mission Mate (an example)

Metcalfe's Law



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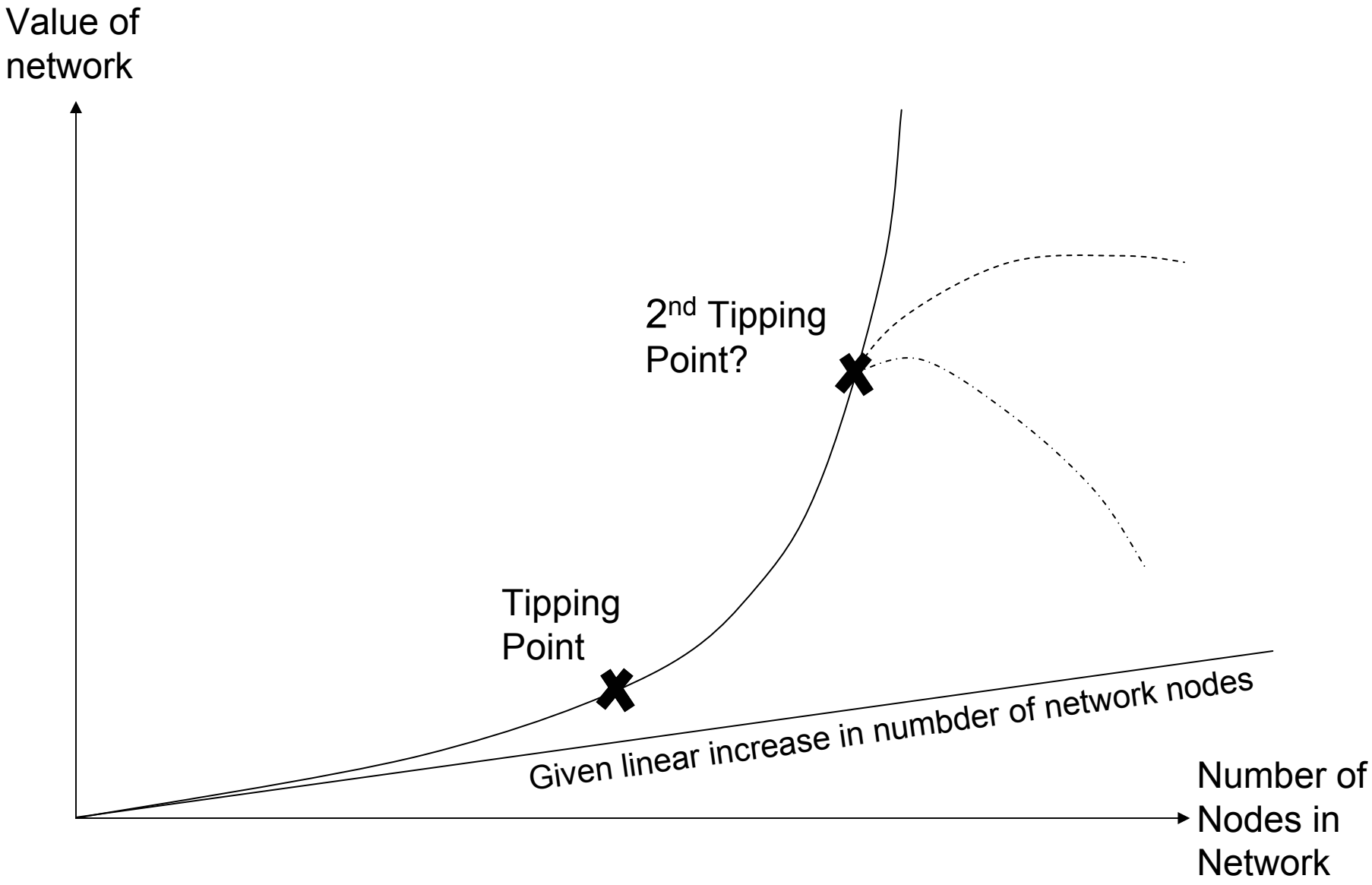

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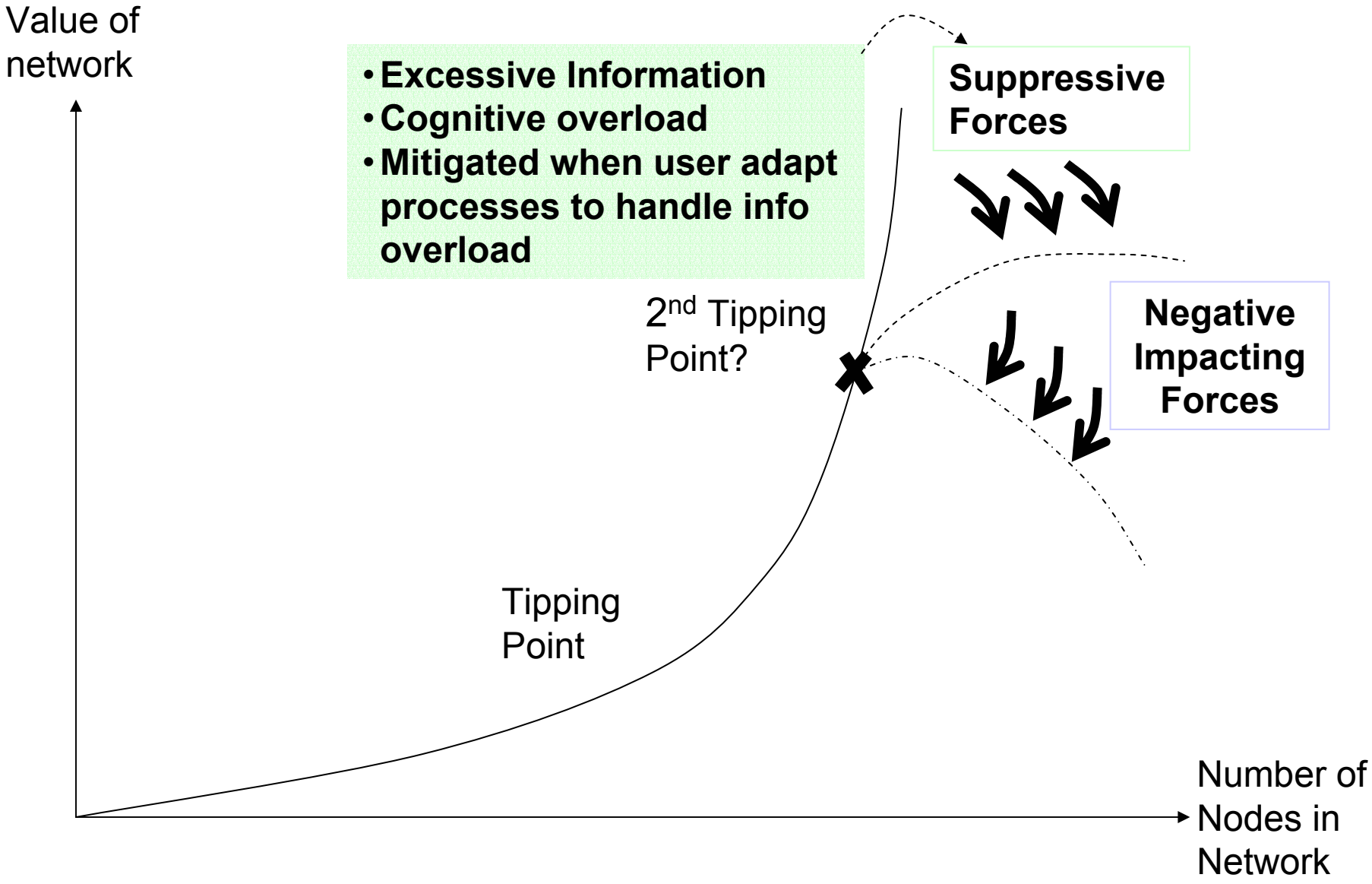

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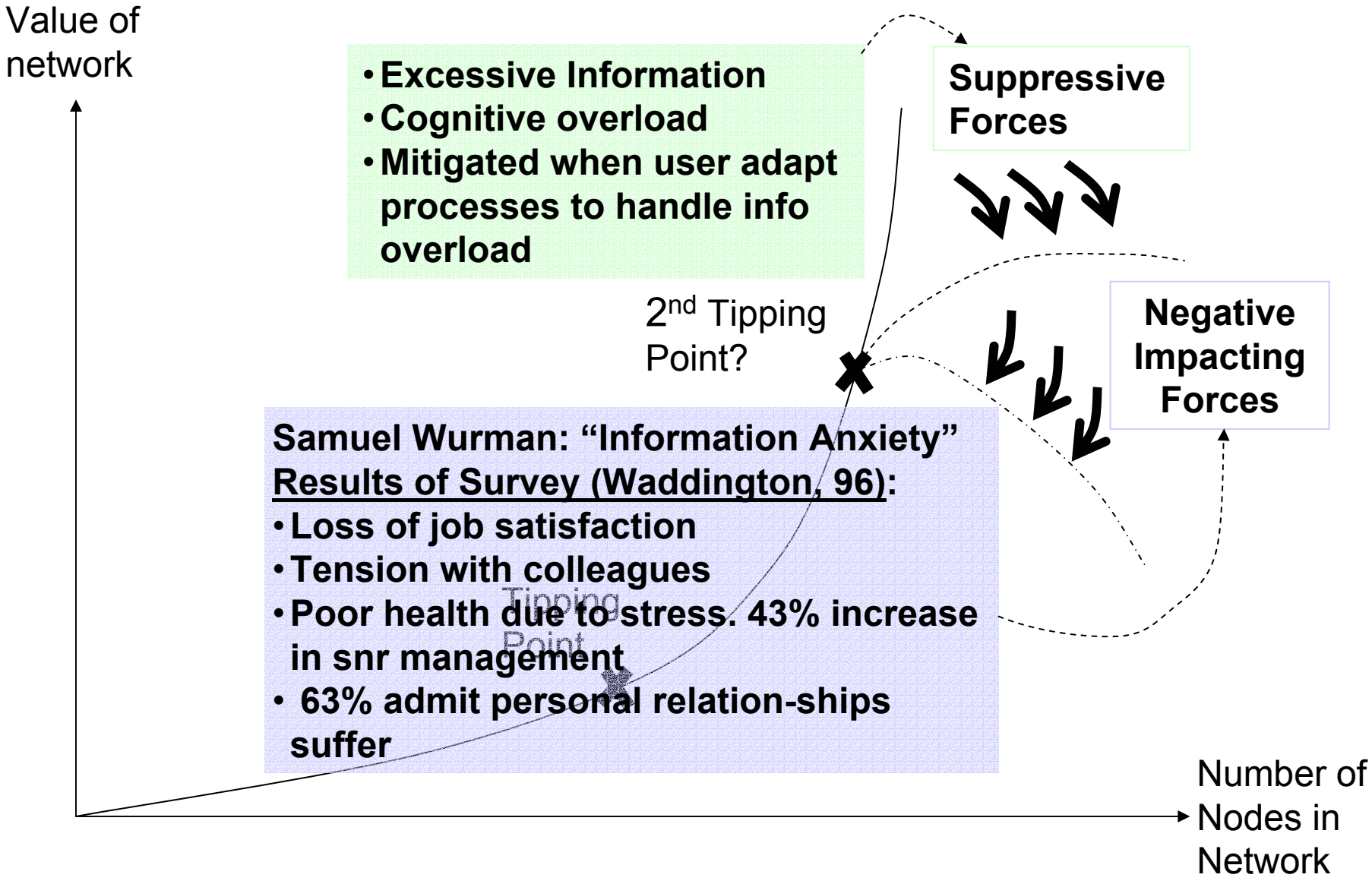

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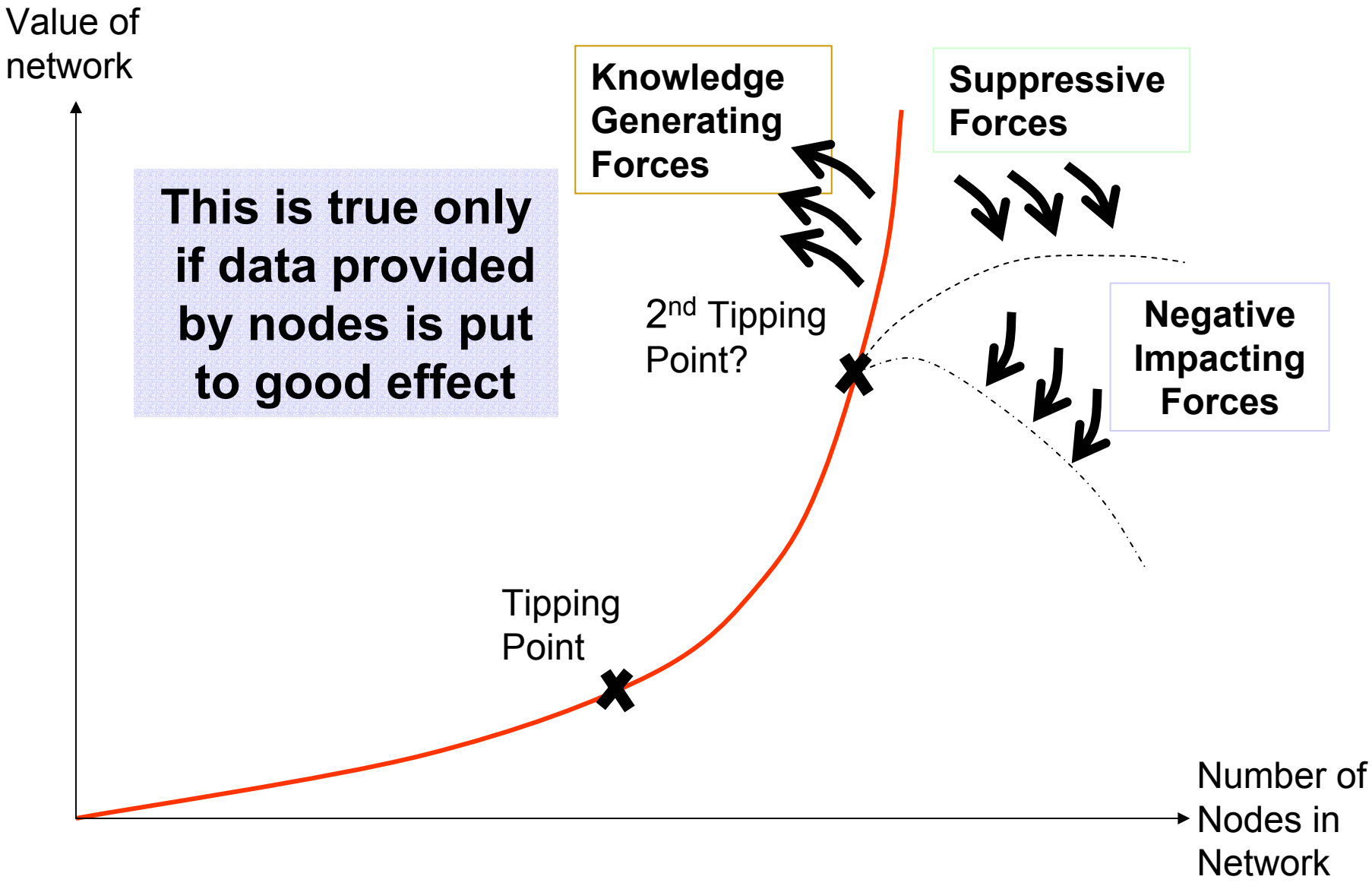


Role of the CCIS

- Enable Knowledge-Centric Operations.

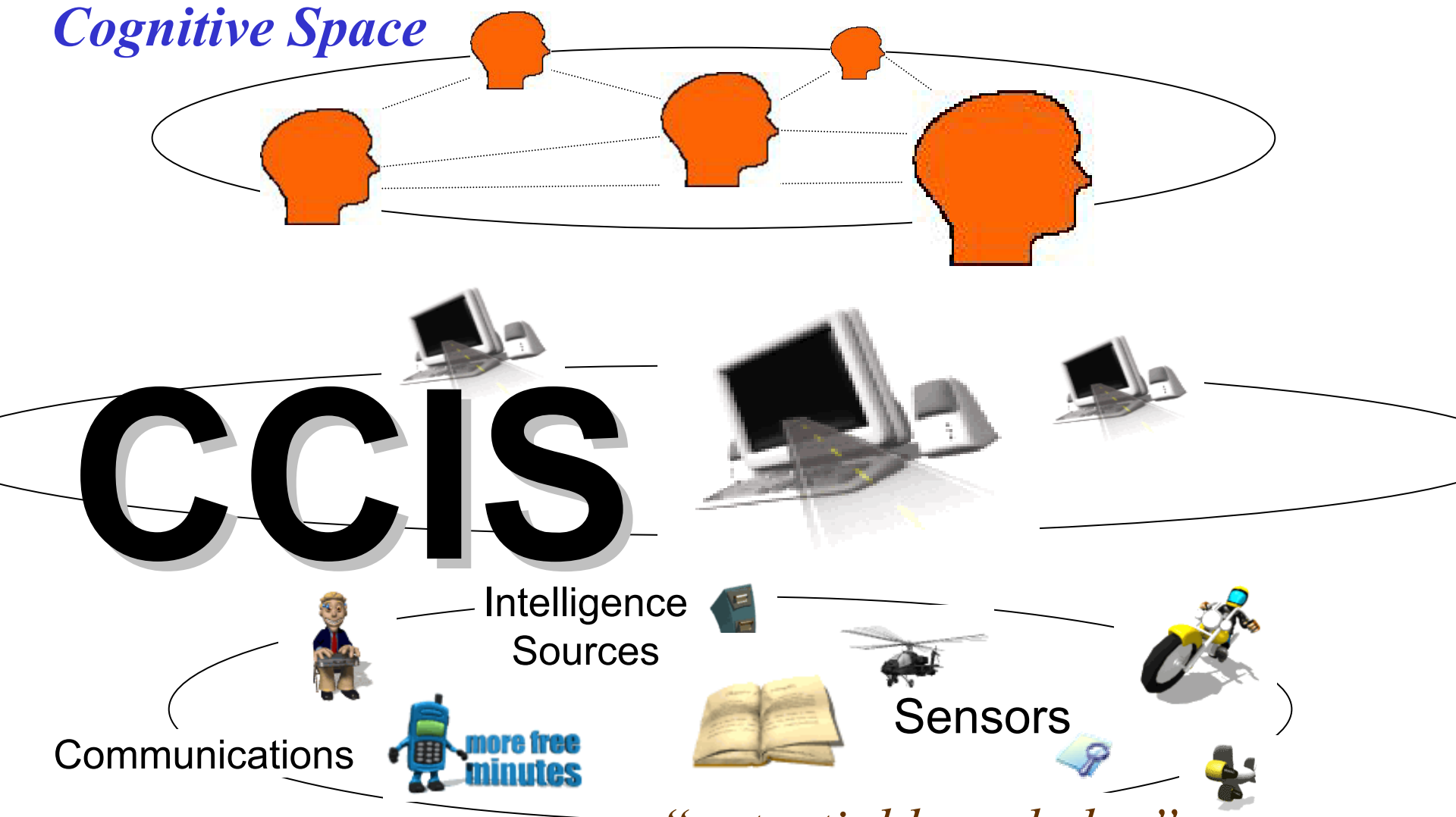
by

- Helping commanders and soldiers make sense of information and help him make the right decisions.

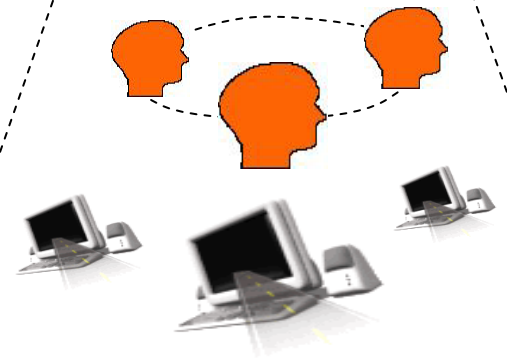
by

- Fusing the decision-makers' *Cognitive Processes* (visualizing, reasoning, understanding, and decision-making) with the *Information Space*.

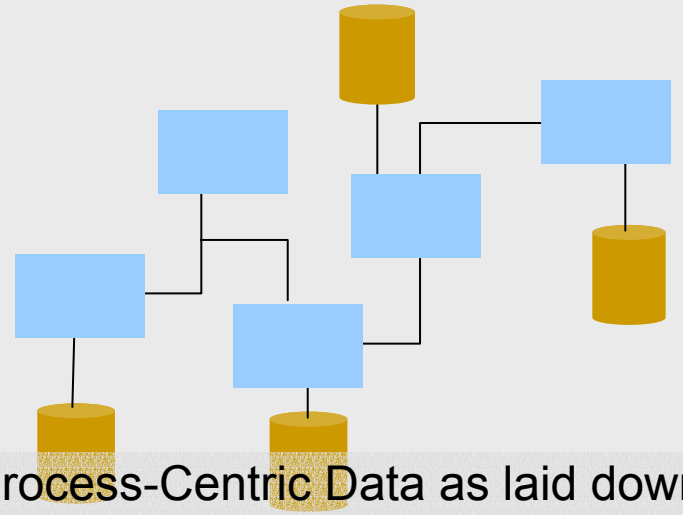
CCIS-An Interface/Medium



Information Space



Untapped information Space
Info / data out there which has not been tapped.



Process-Centric Data as laid down during System Development

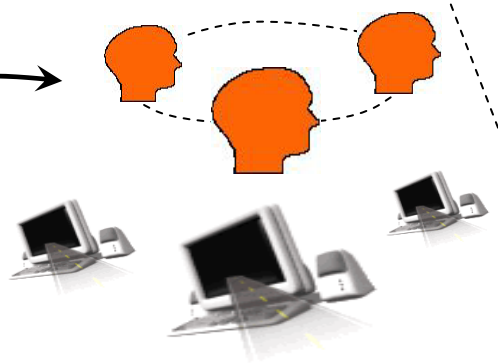
Unexploited information Space
Info / data owned by the organization but nothing is done to use it.

Total Information Space

Information Space

Dynamic & Interactive Search System

Sensors



Expanding the Information Exploitation Space

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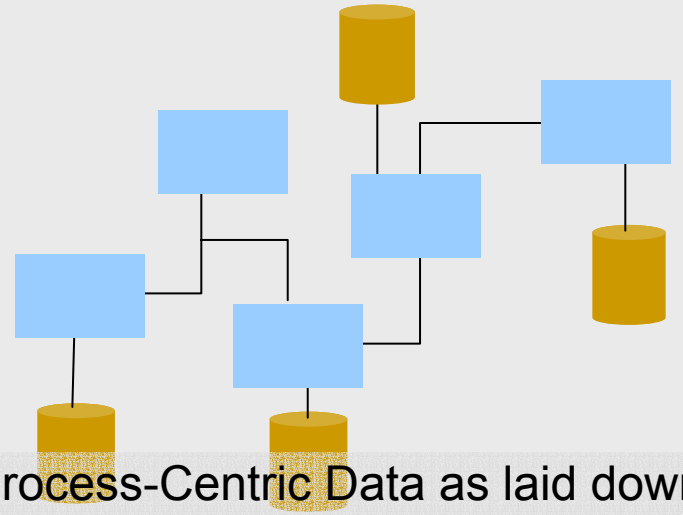

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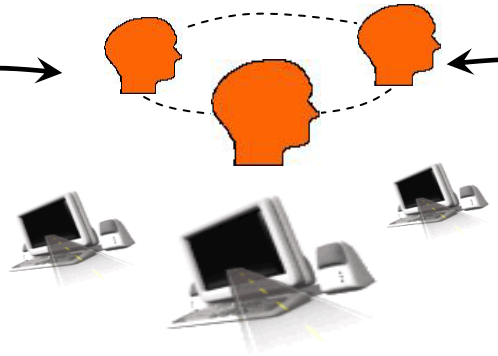

Data Mining & Analysis

Untapped information Space
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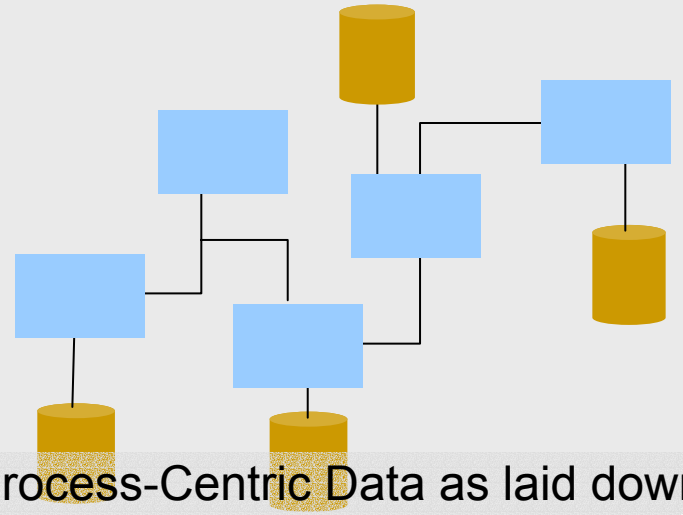

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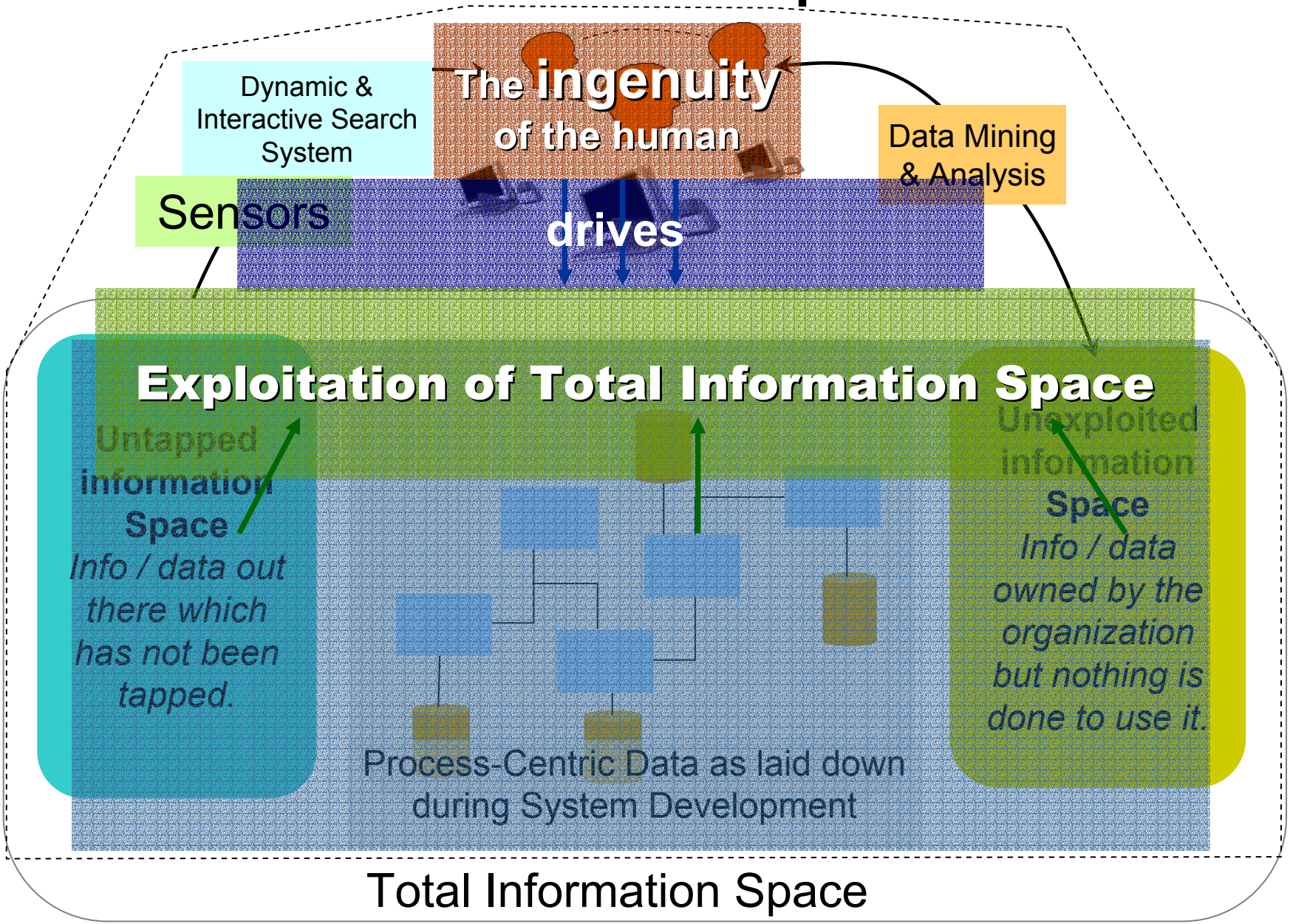
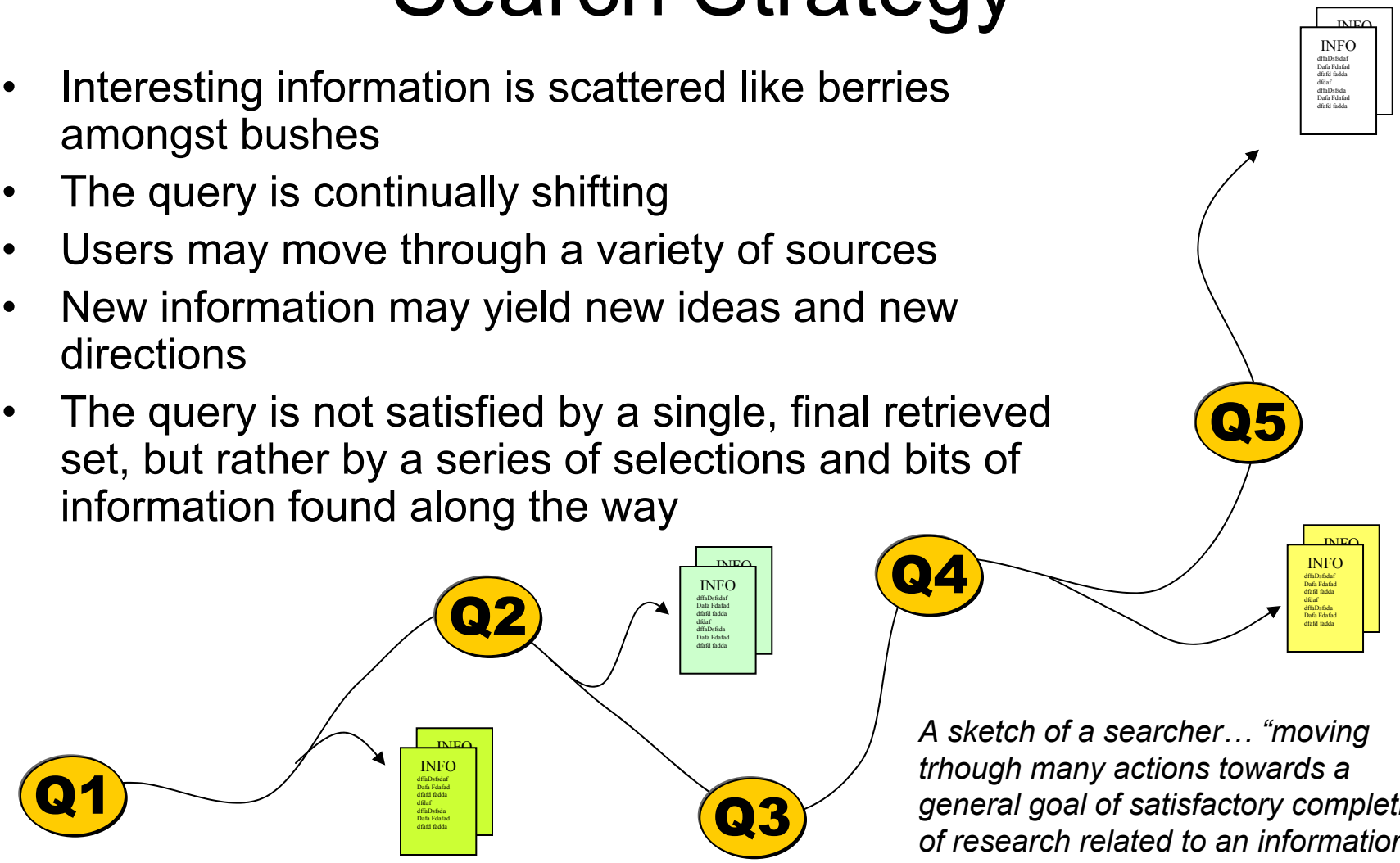


Berry Picking as an Information Search Strategy

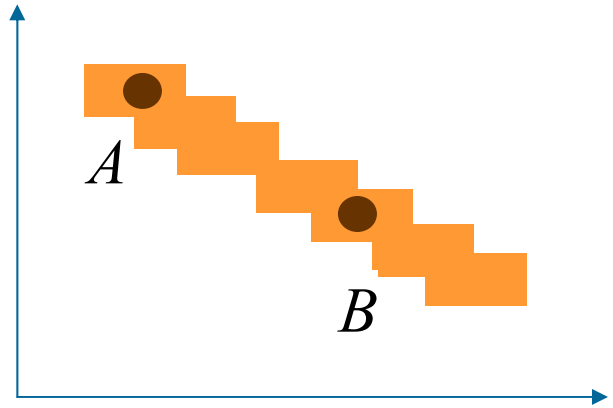
- Interesting information is scattered like berries amongst bushes
- The query is continually shifting
- Users may move through a variety of sources
- New information may yield new ideas and new directions
- The query is not satisfied by a single, final retrieved set, but rather by a series of selections and bits of information found along the way



A sketch of a searcher… "moving trhough many actions towards a general goal of satisfactory completion of research related to an information need." (Bates 89)

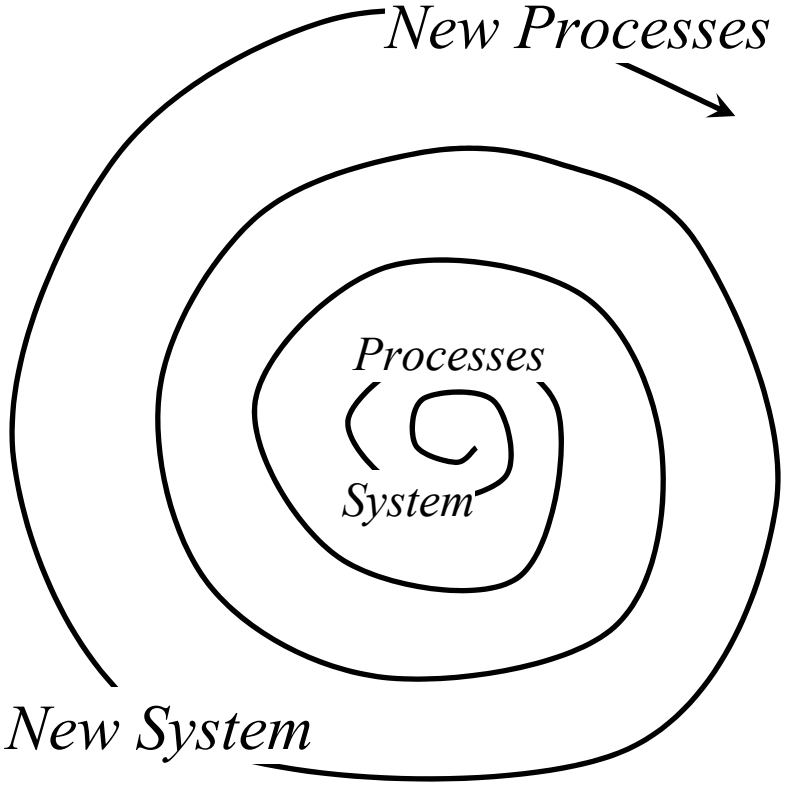
Cognitive Space : Experiences in CCIS Developments

Waterfall Model is inflexible & unable to meet ever changing demands



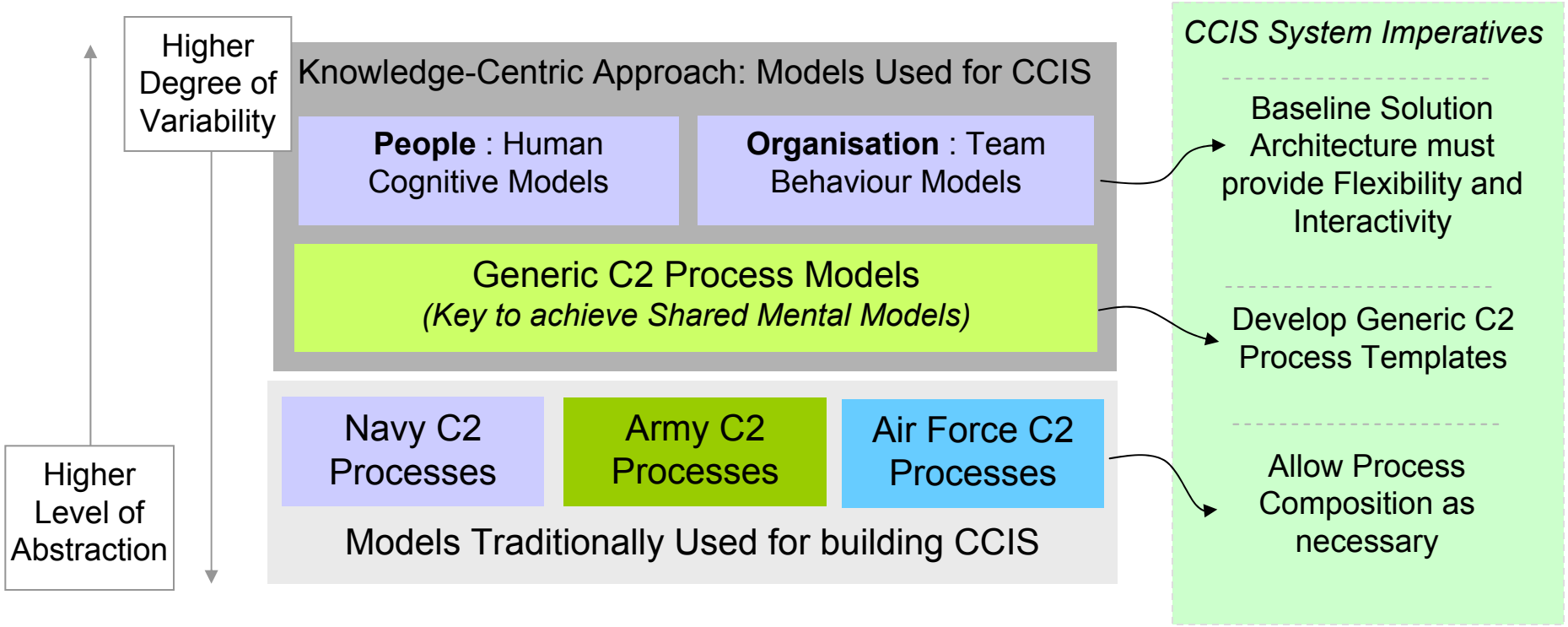
Many things change between pt A & B:

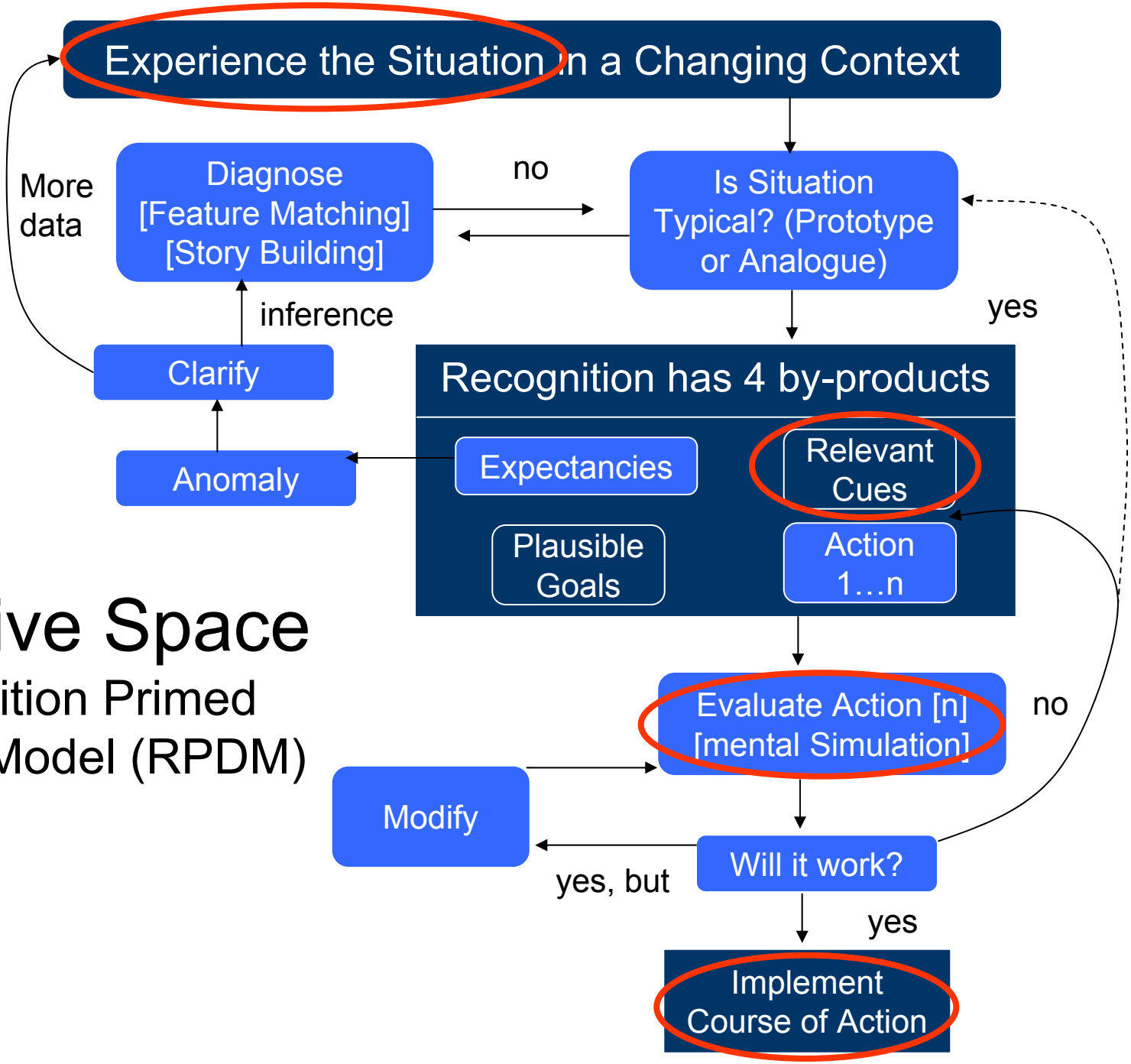
- *Transformation*
- *People & Organisation Changes*



The fact is…system engineering & processes are iterative and spiraling

Levels of Abstraction and Corresponding degrees of variability



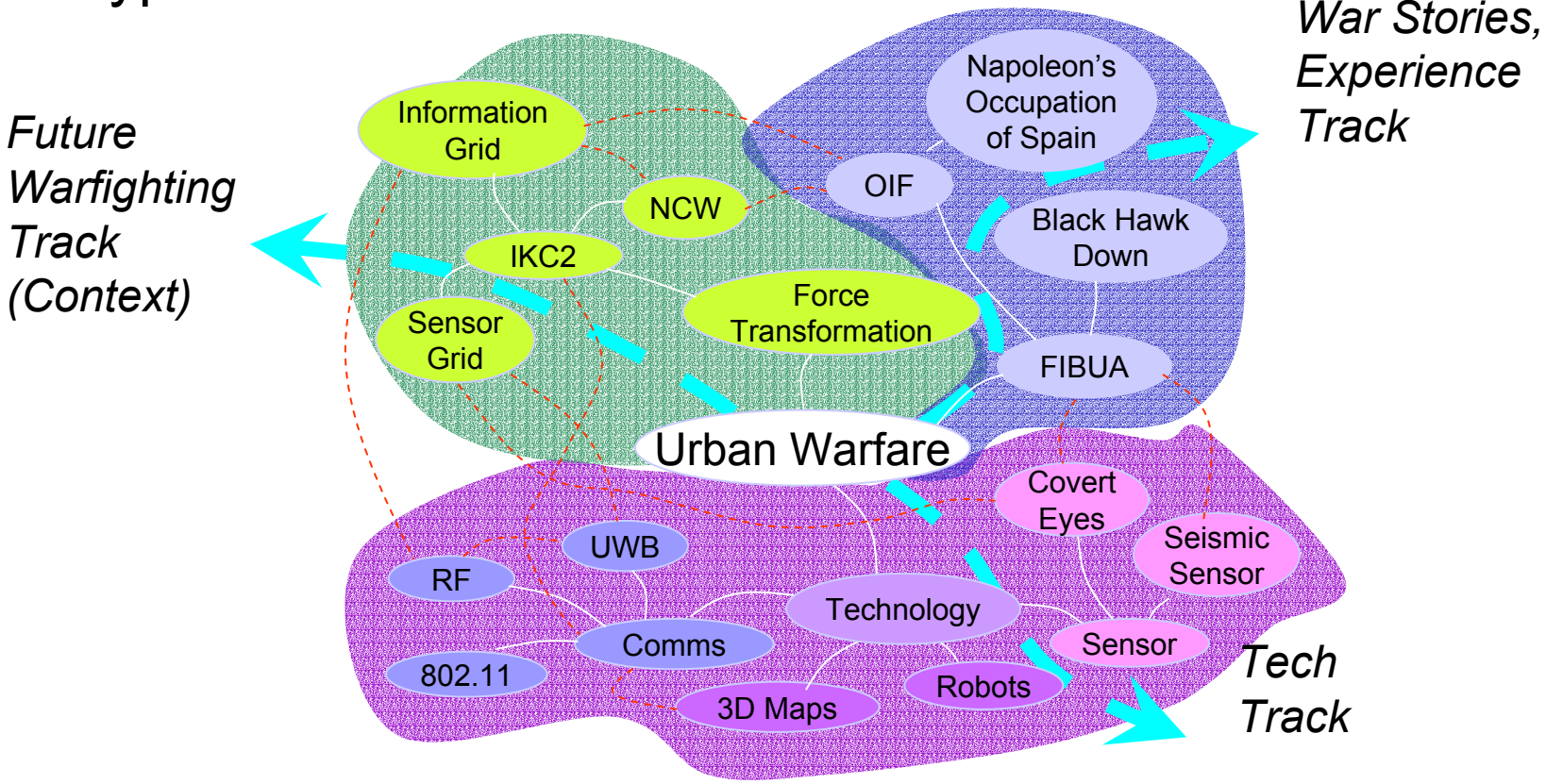


Cognitive Space

Recognition Primed Decision Model (RPDM)

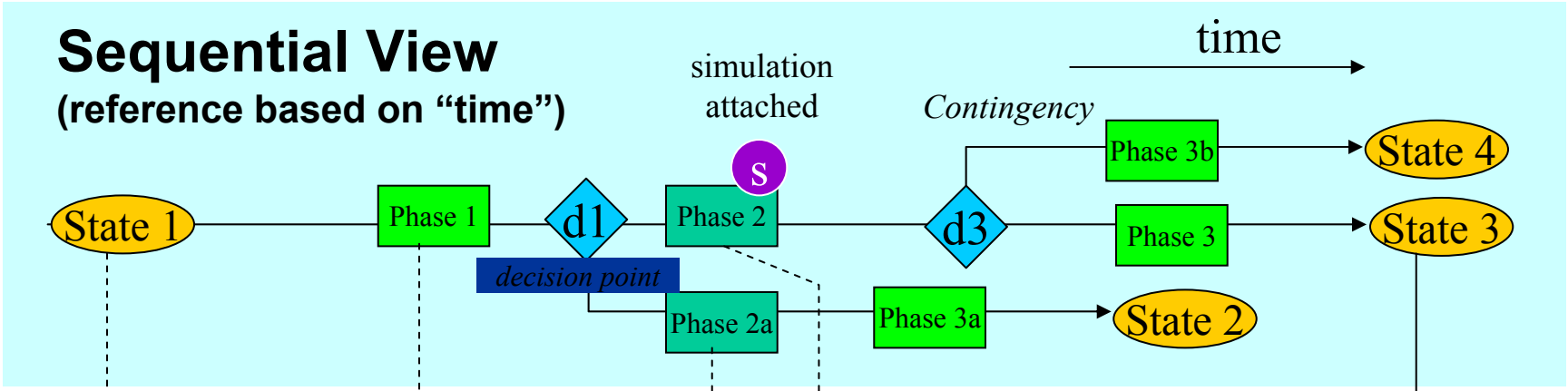
Cognitive Space – Hyperlinking is Natural

- Knowledge retrieval is associative.
  - Human Associative Model (HAM),by Anderson and Bower.
  - Spreading Activation Theory by Collins and Loftus
- Hypertext

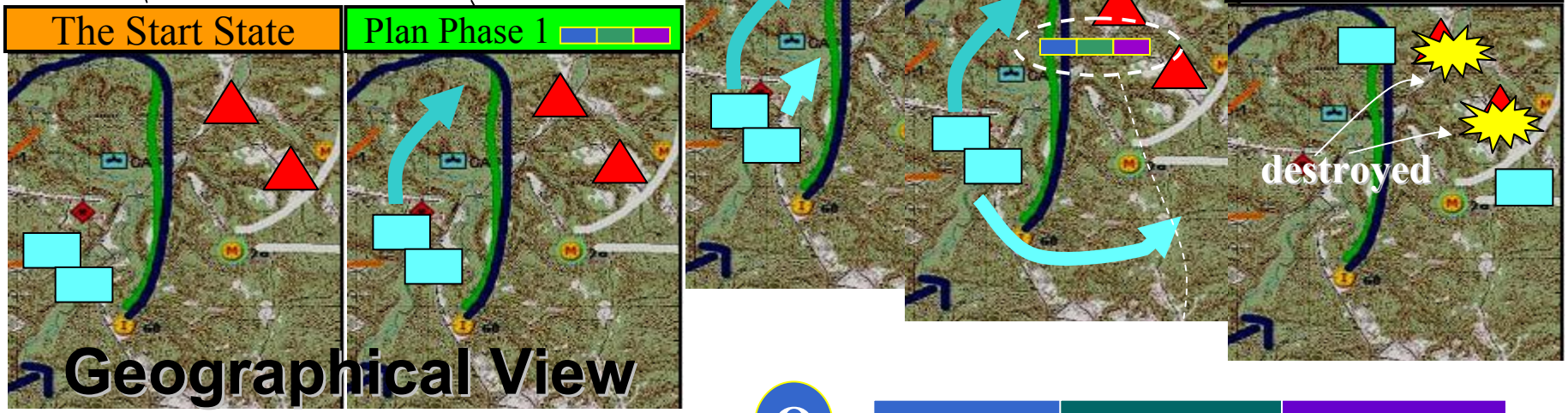


Cognitive Space – Thinking is Structural (Gestalt Psychology)

The Analysis of the Situation / The Ops Order / The Evolving States



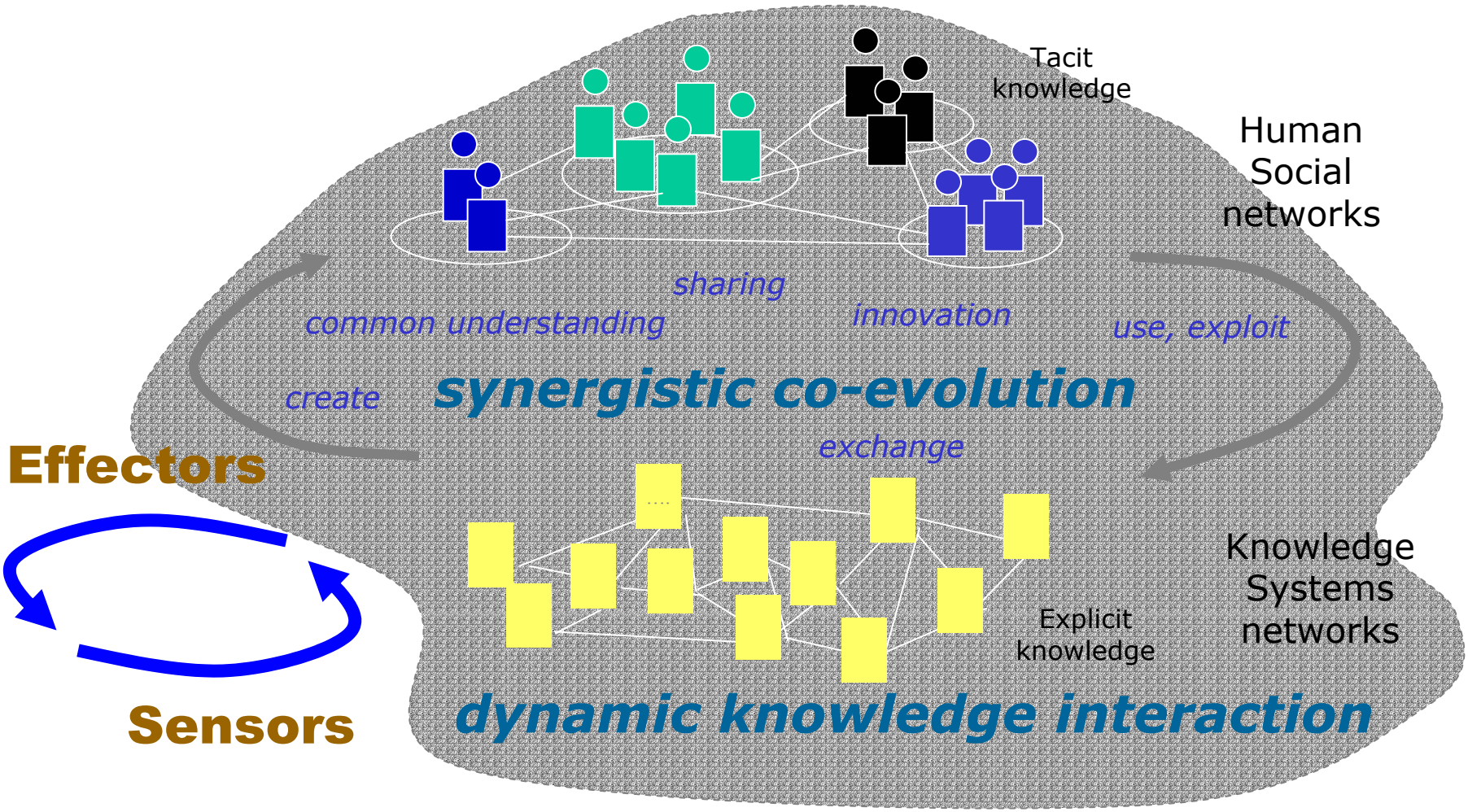
Train of Thoughts



Q

rationale | constraints | Anti-goals

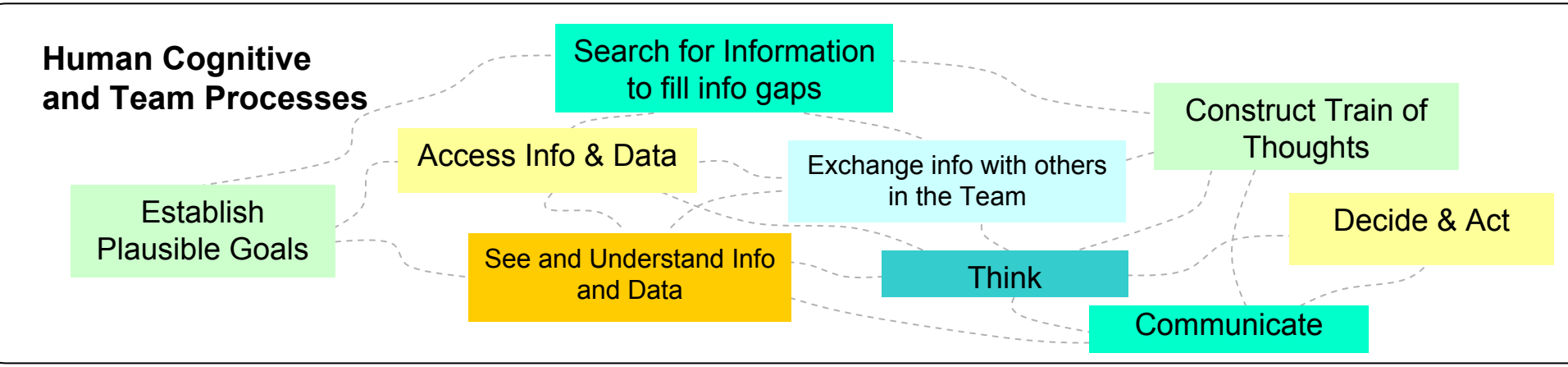
Cognitive Space - Knowledge Network

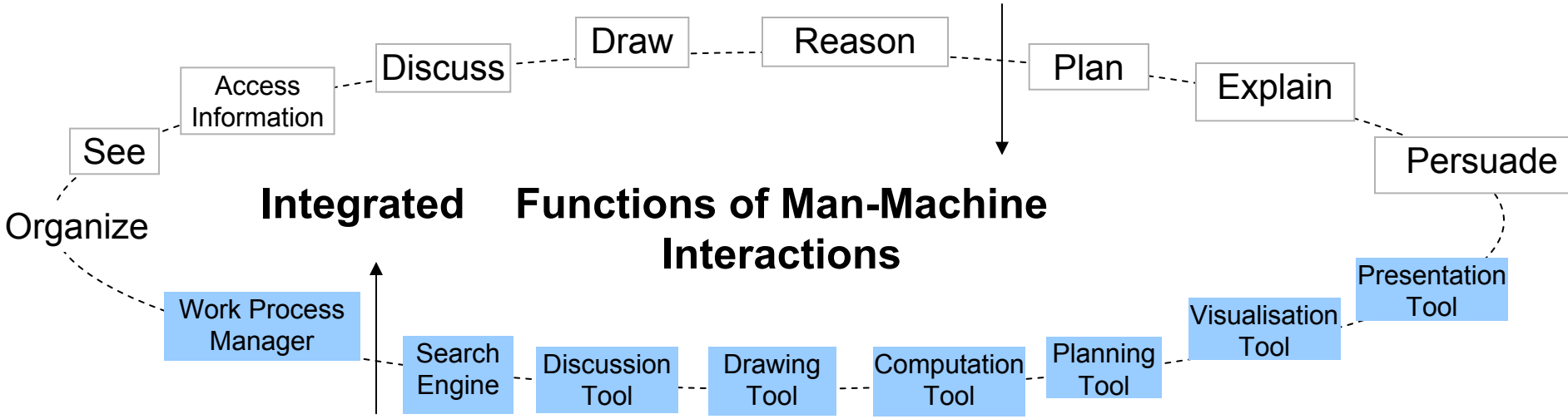


Cognitive Space

Theory	Postulate	Evidence
Recognition Primed Decision Making Model (RPDM)	Decisions will be based on situation understanding. *Seeing* is important	GIS, imagery, video etc. are key to decision making
Spreading Activation Theory	Concepts, ideas & knowledge are linked	Success of Hyperlinking in WWW
Gestalt Psychology – Thinking is structural	Understanding is achieved by active construction of knowledge	Success of apps like Power-Point & Excel
Knowledge Networking	Knowledge is created through networks of knowledge	We cannot do without email, chat, telephones

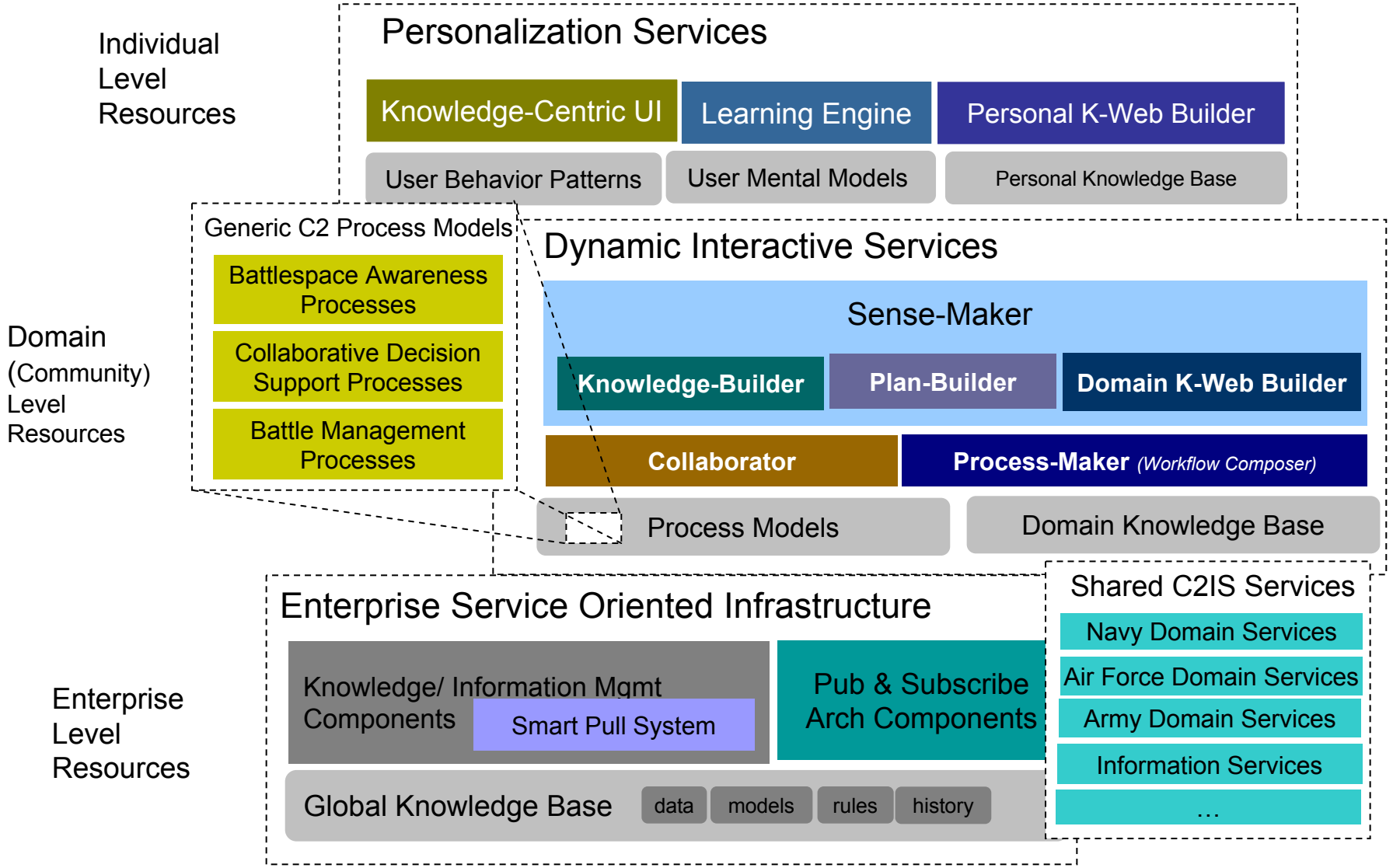
What are the basic features that a CCIS should provide? (Baseline Solutions Architecture)





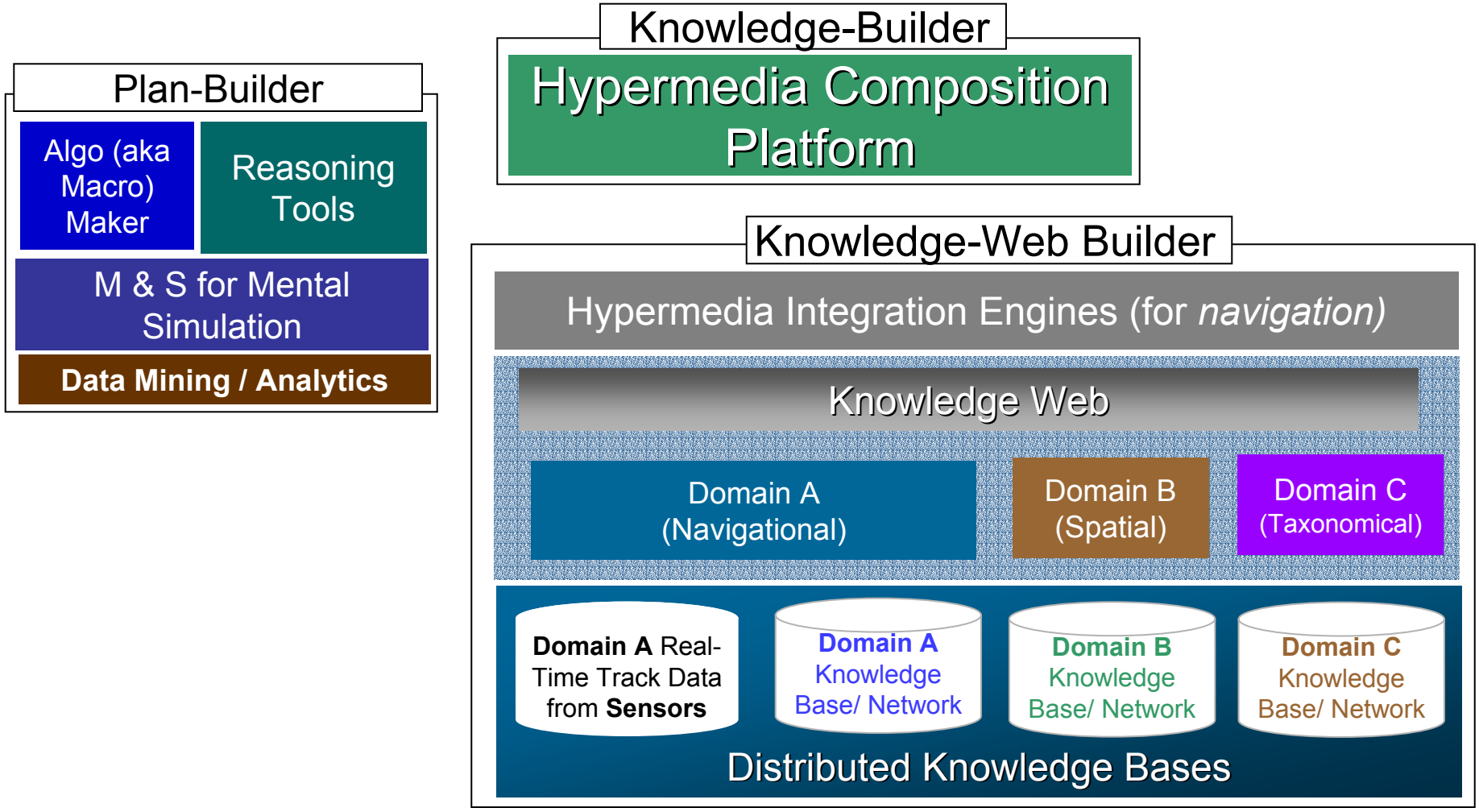
System Flexible and Interactive CCIS System

C2KS Architecture



Sense-Maker Architecture

for ad-hoc construction of thoughts

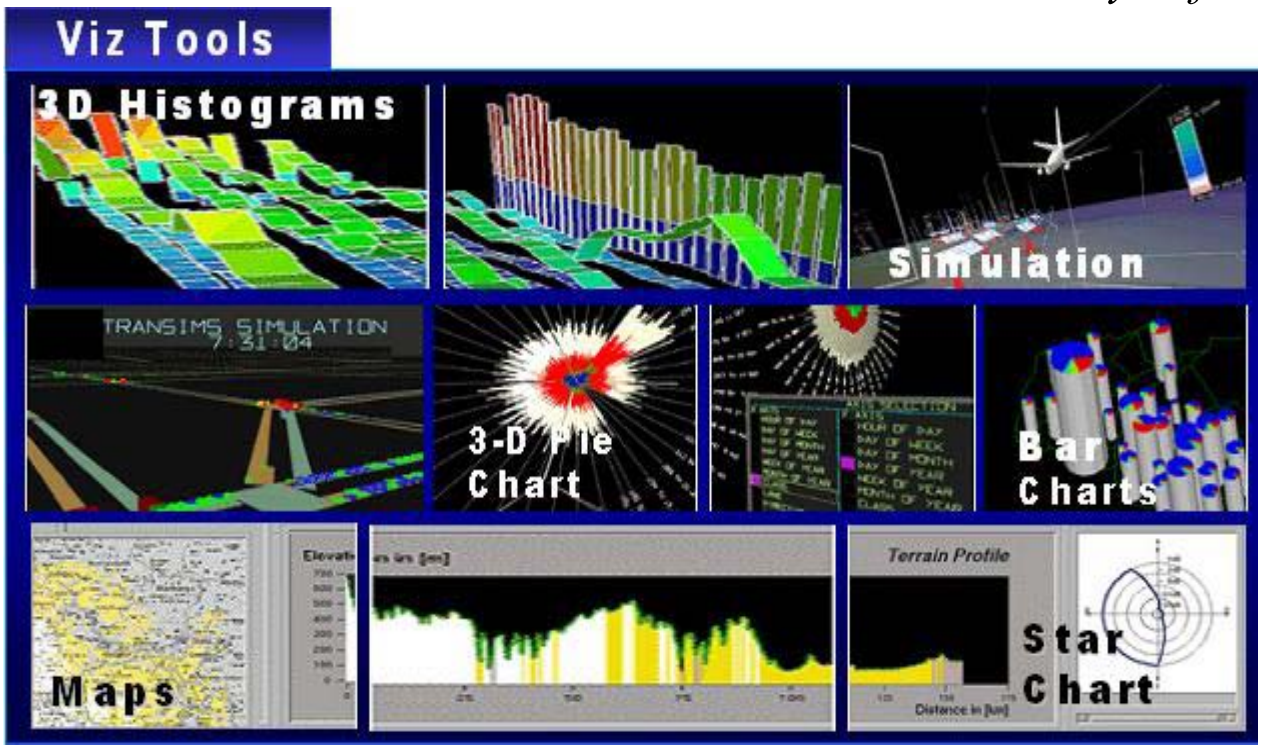


Knowledge Builder

A palette of visualization options giving info users a variety of means to explore his information or data.

"Ways of Seeing"

Need to establish how to best present information



Need to offer the user multiple perspectives to look at the same piece of information => insights

Need to provide users with a means to explain an idea, or a plan.

Knowledge-Web Builder : Spatial Hyperlinks

Spatial

Map provides spatial anchors for information

Enable **Effective** Depiction of:

- Own forces status
- Enemy status
- Movements
- Environment
- Intention & Plan
- Incidents & Events

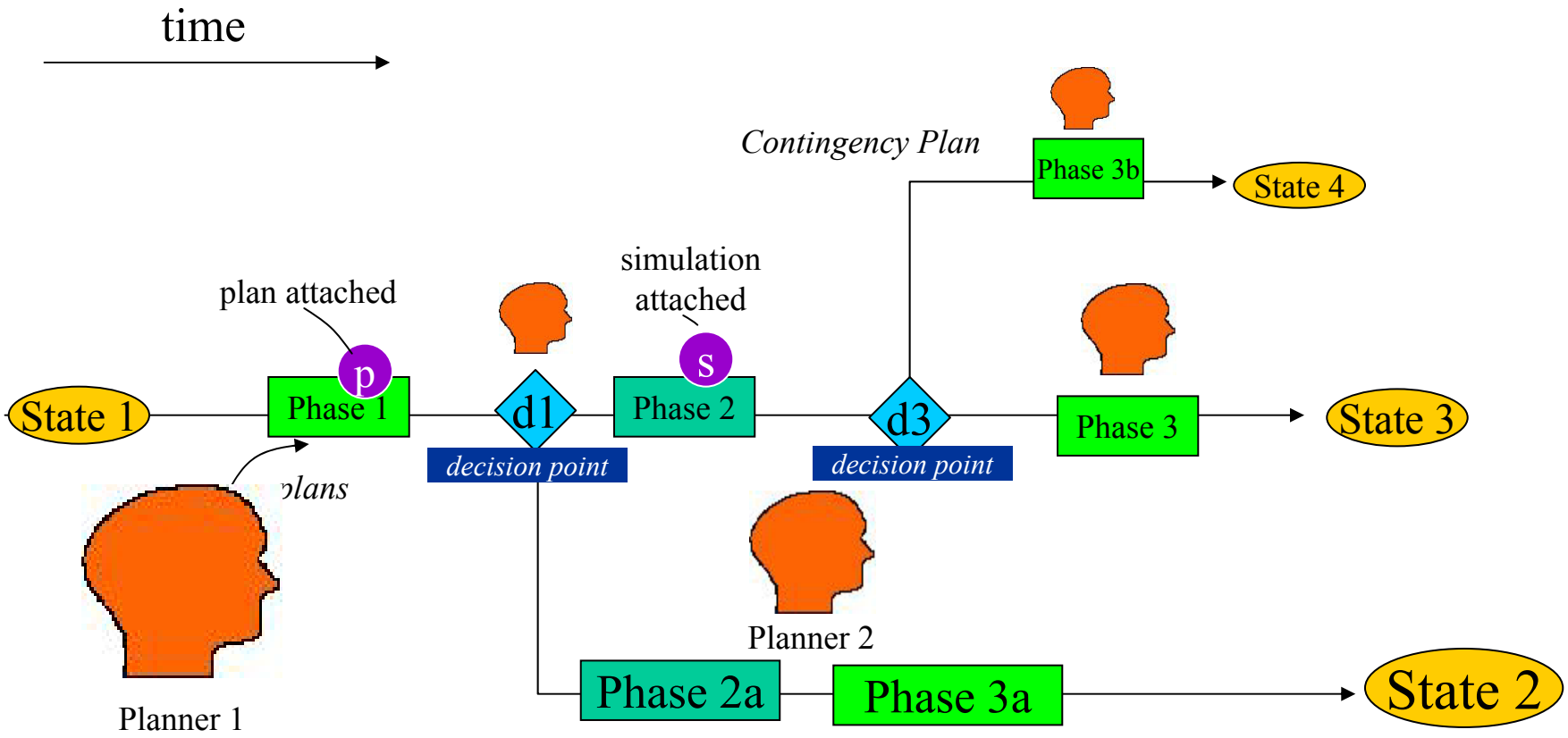
Spatial features gives immediate appreciation of geography-based info. Imagine having to explain position & movements of own forces in text!

Spatial reference points help relate events to location. E.g. terrain effects on tank maneuvers occurred at the same spot in the past.

"As we may think" *Vannevar Bush*

Process-Maker Architecture

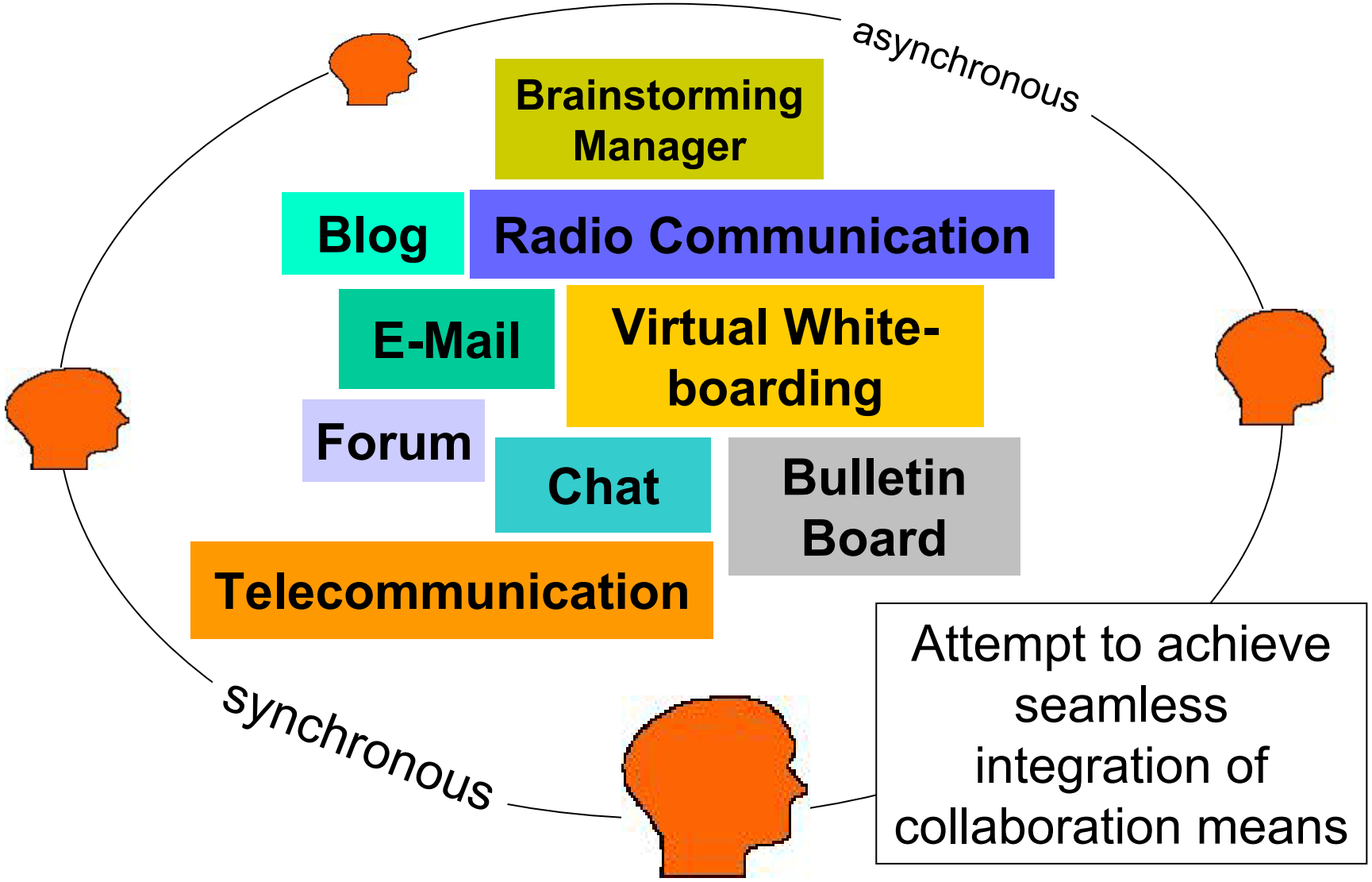
for ad-hoc construction of processes



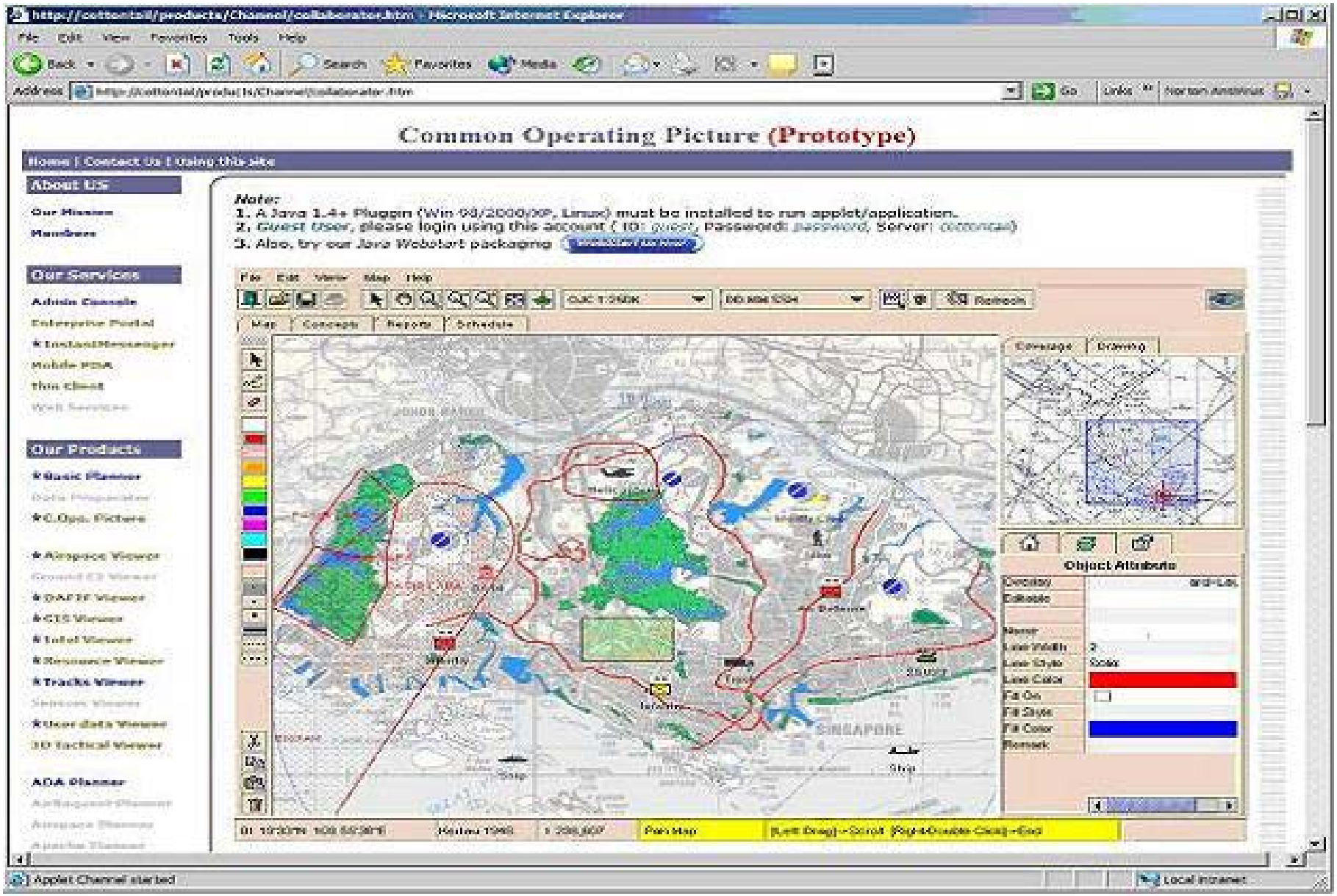
Gives users power to construct organizational processes in ad hoc manner

Collaborator

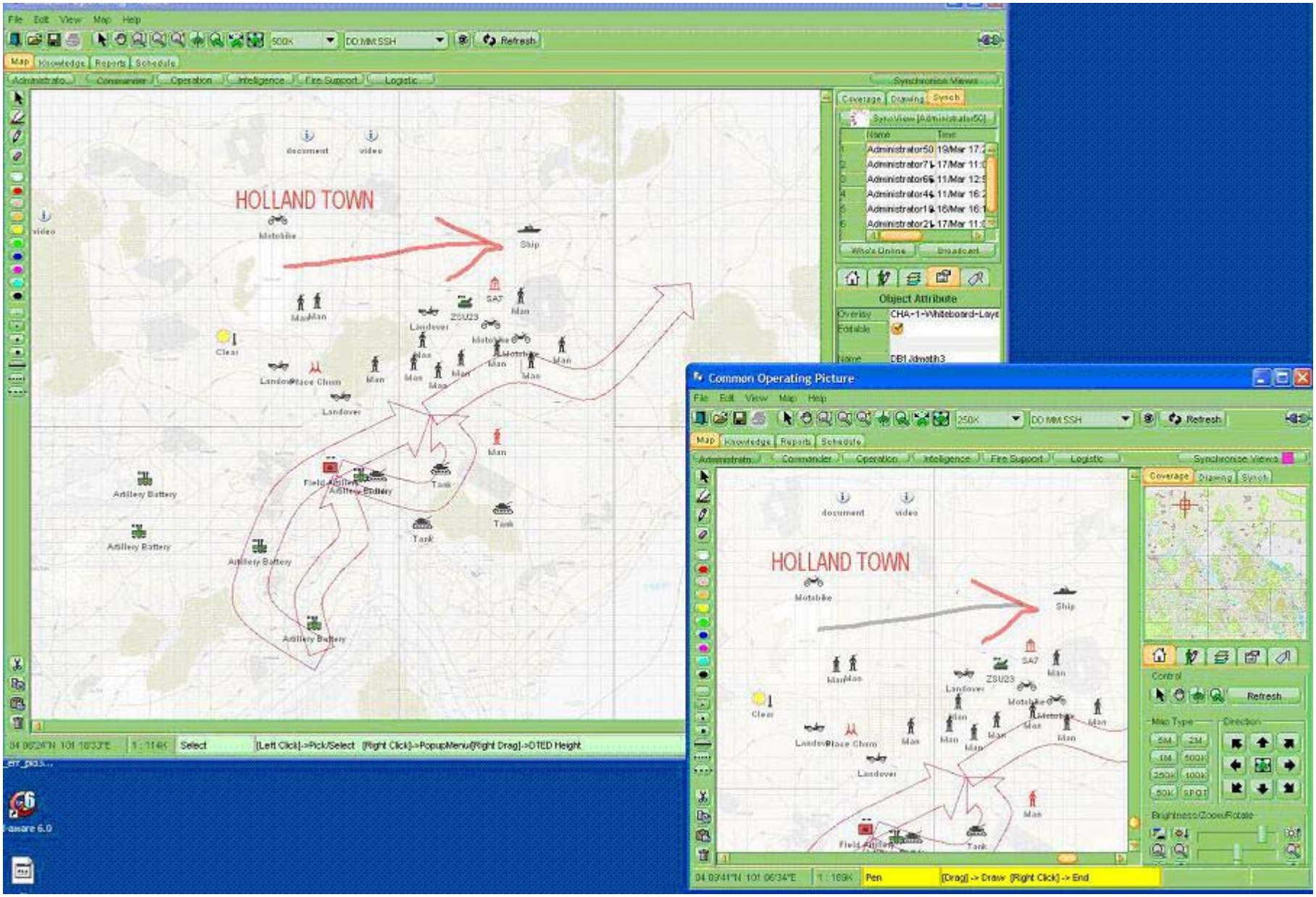
connecting people



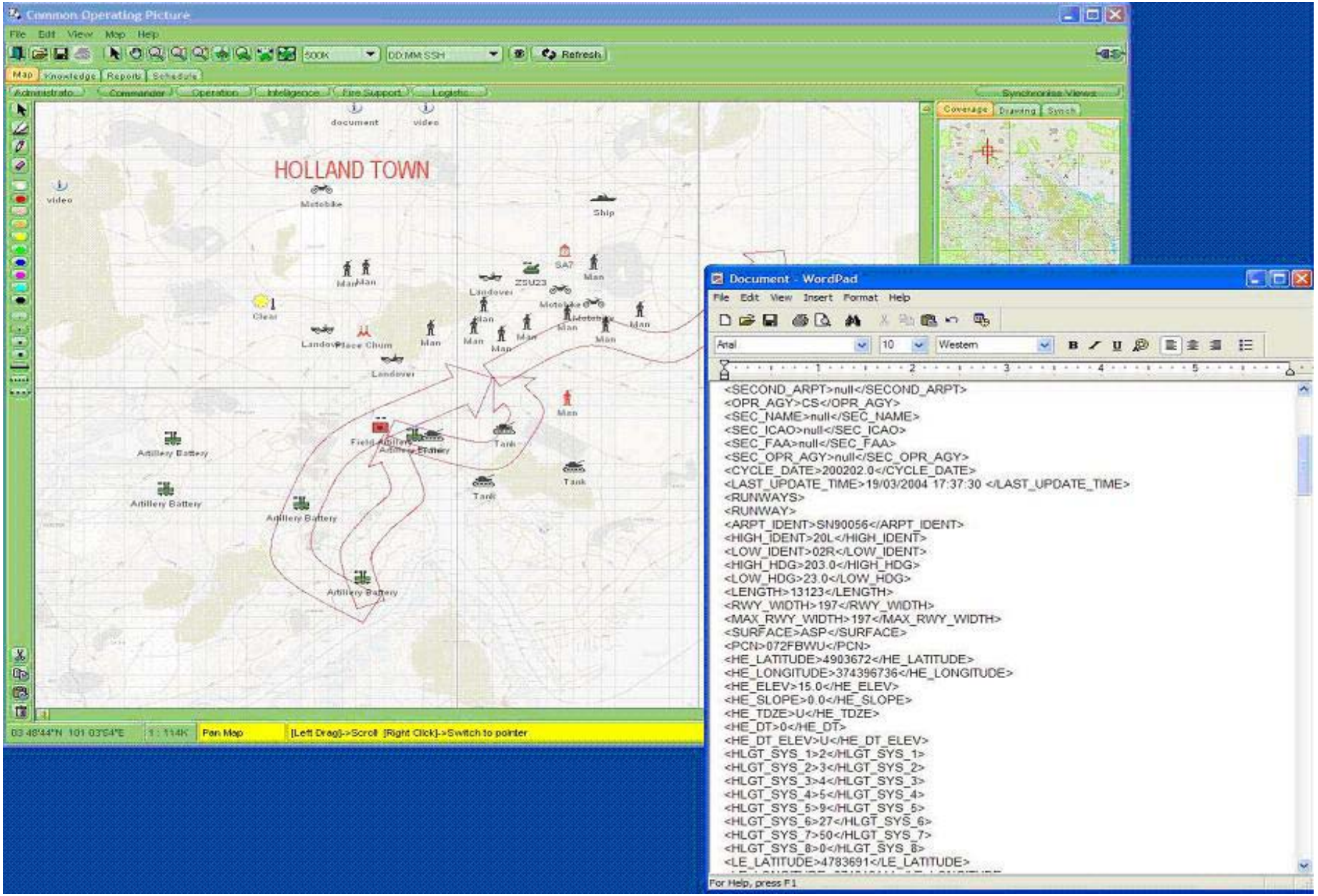
Mission Mate – Service Oriented Architecture



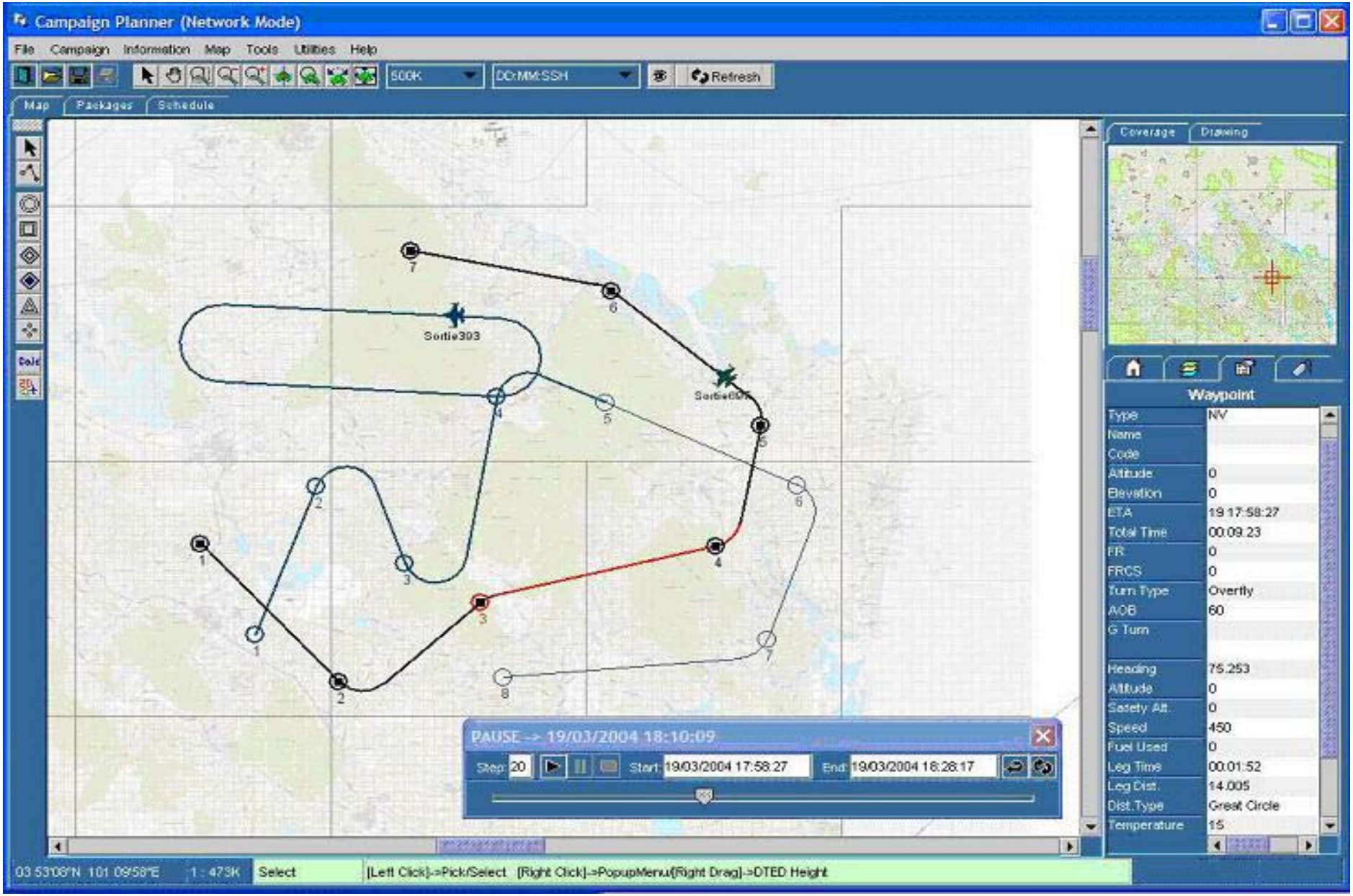
Mission Mate – Information Architecture



Mission Mate – Information Architecture



Mission Mate – Time Slider for Mission Rehearsal



Thank you